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US Army Corps of Engineers

Toxic and Hazardous Materials Agency

FINAL ASBESTOS SAMPLING PLAN

Fort Douglas
Environmental Investigation/Alternatives Analysis

Contract Number DAAA-15-90-D-0018
Task Order 0005, Data Item A009

Prepared For

Commander
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland 21010-5401

Prepared By

R. L. Stollar & Associates Inc.
URS Consultants, Inc.
PTI Environmental Services
Urie Environmental Health, Inc.
DataChem Laboratories
Environmental Science & Engineering, Inc.
Environmental Hazards Specialists
International, Inc.

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June 1991

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Statement A per telecon Mark Mahoney
Army Toxic & Hazardous Materials Agency
ATTN: CETHA-BC-A
APG, MD 21010-5401
NWW 7/20/92

FINAL ASBESTOS SAMPLING PLAN

JUNE 1991

CONTRACT NO. DAAA-15-90-D-0018

TASK ORDER 0005

FORT DOUGLAS
ENVIRONMENTAL INVESTIGATION/ALTERNATIVES ANALYSIS

Prepared by:

R. L. STOLLAR & ASSOCIATES INC.
URS CONSULTANTS, INC.
PTI ENVIRONMENTAL SERVICES
URIE ENVIRONMENTAL HEALTH, INC.
DATACHEM LABORATORIES
ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
ENVIRONMENTAL HAZARDS SPECIALISTS INTERNATIONAL, INC.

Prepared for:

U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY

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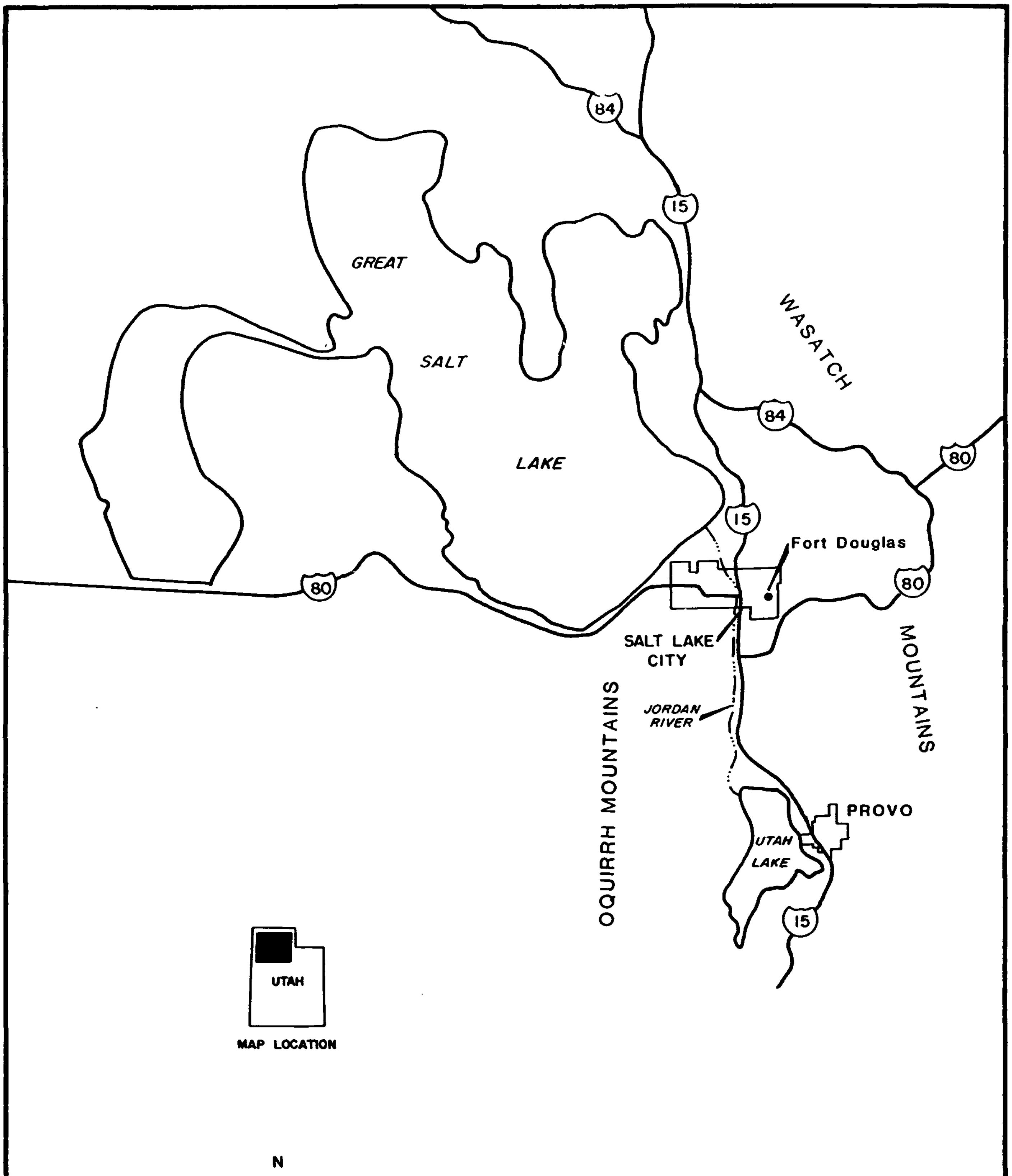
LIST OF ACRONYMS AND ABBREVIATIONS

AA	Alternatives Analysis
ACBM	asbestos containing building material
ACM	asbestos containing material
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industry Hygiene Association
DEH	Directorate of Engineering and Housing
EI	Environmental Investigation
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
f/cc	fibers per cubic centimeter
HASP	Health and Safety Plan
HEPA	high efficiency particulate air
IRDMS	Installation Restoration Data Management System
NCO	non commissioned officer
NESHAP	National Emission Standards for Hazardous Air Pollutants
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PEL	permissible exposure limit
QAPP	Quality Assurance Project Plan
QC	quality control
Stollar	R.L. Stollar and Associates
TSI	thermal system insulation
USATHAMA	United States Army Toxic and Hazardous Materials Agency

1.0 INTRODUCTION

This Asbestos Sampling Plan has been developed to guide an asbestos survey at Fort Douglas, Utah, (Figure 1-1) in support of an Environmental Investigation/Alternatives Analysis (EI/AA). The EI/AA is being conducted in support of the closure of approximately 51 acres of Fort Douglas, which was directed by the Base Closure and Realignment Act (Public Law 100-526). The U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) has been assigned the responsibility for centrally managing the Fort Douglas EI/AA program. The EI/AA is designed to assess hazardous substances which are known or suspected to be present at the site and to evaluate remedial actions which may be necessary to control releases to the environment prior to transfer of Fort Douglas. The closure and realignment of Fort Douglas will result in the reassignment of its functions to other installations. Following closure, approximately 51 acres of the 119-acre installation will be declared as excess property (Figure 1-2) for public disposal. The remaining acreage will be retained by the federal government for use as a military Reserve Center.

The asbestos sampling program will be conducted at the buildings in the area of Fort Douglas to be excessed. The purpose of the sampling program is to identify all areas that may have asbestos-containing materials (ACMs) and the type of ACMs present, delineate the extent of the ACMs, and assess the extent and condition of friable versus nonfriable ACMs and the potential for disturbance. ACMs are defined as materials containing more than one percent asbestos by weight, either alone or mixed with fibrous or non-fibrous materials. The sampling and survey results will be incorporated in an asbestos report for Fort Douglas and used to perform a risk assessment and determine if any remedial actions need to be taken. This risk assessment will focus on the buildings containing asbestos and will not be incorporated into the EI/AA risk assessment. All asbestos related activities and reports will follow the standards of the U.S. Environmental Protection Agency (EPA) (40 CFR Part 763 Subpart E), Asbestos Hazard Emergency Response Act; Utah state regulations; and U.S. Army Technical Manual (TM5-612), Asbestos Control. The Asbestos Sampling Plan provides a detailed description of the sampling program, including survey and sampling procedures and the approximate number and location of the asbestos samples. A description of the overall technical program for the EI/AA is presented in the Draft Technical Plan. The Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP) provide additional technical guidance for the field program.



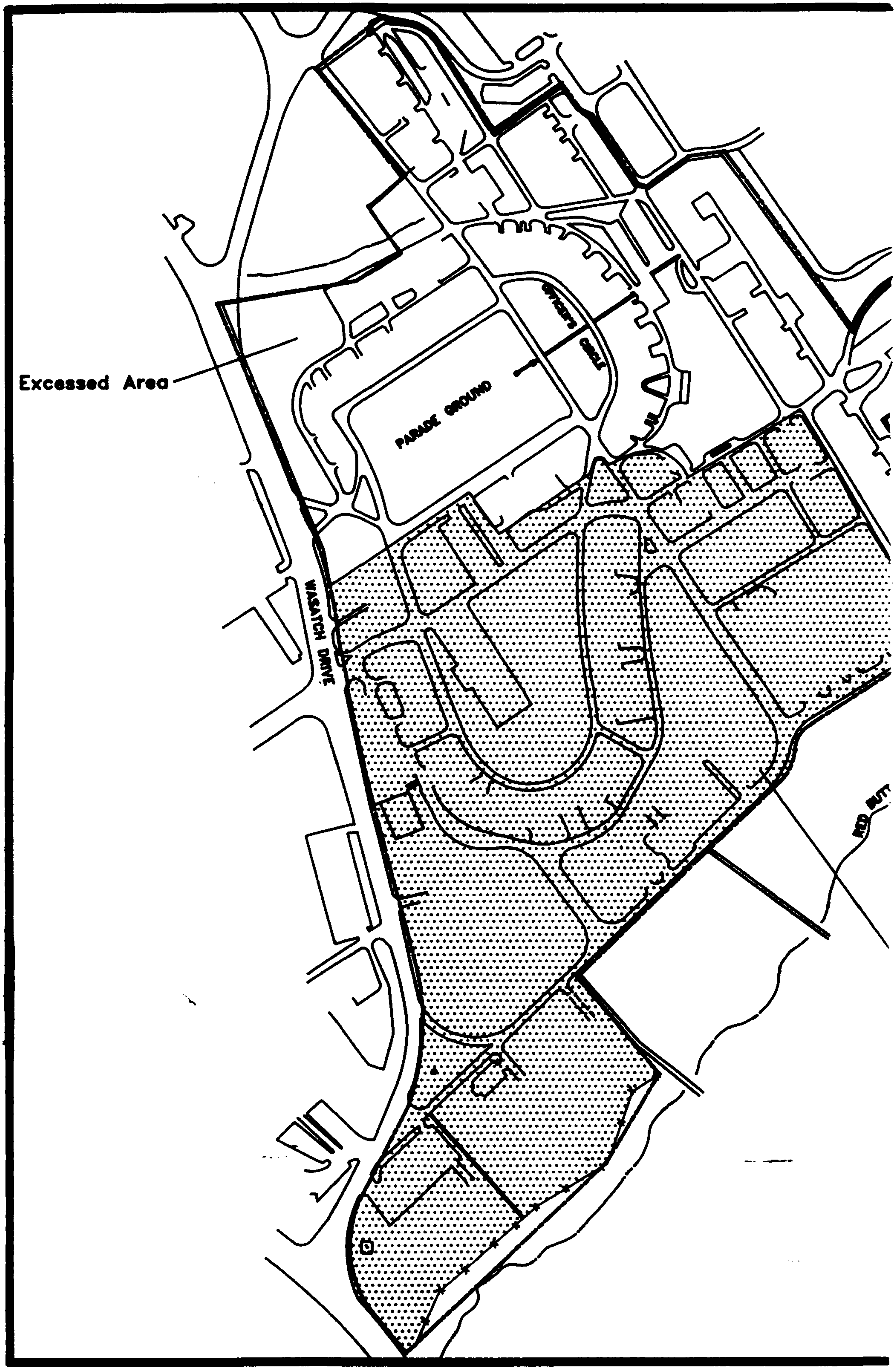
R.L. STOLLAR & ASSOCIATES INC.
Denver, Colorado

Fort Douglas
Location Map

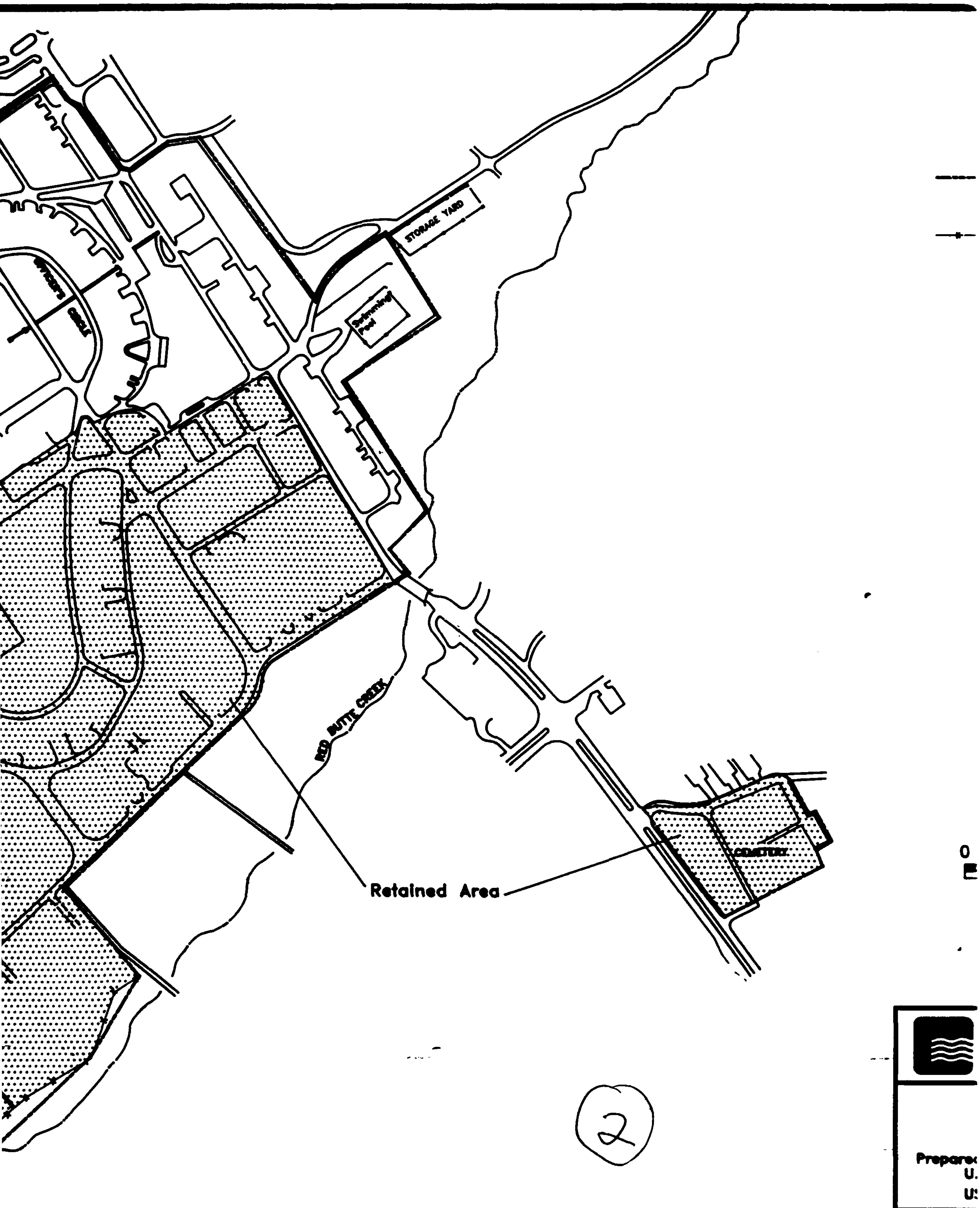
Prepared for : U.S. Army Corps of Engineers
USATHAMA

Date: May, 1991

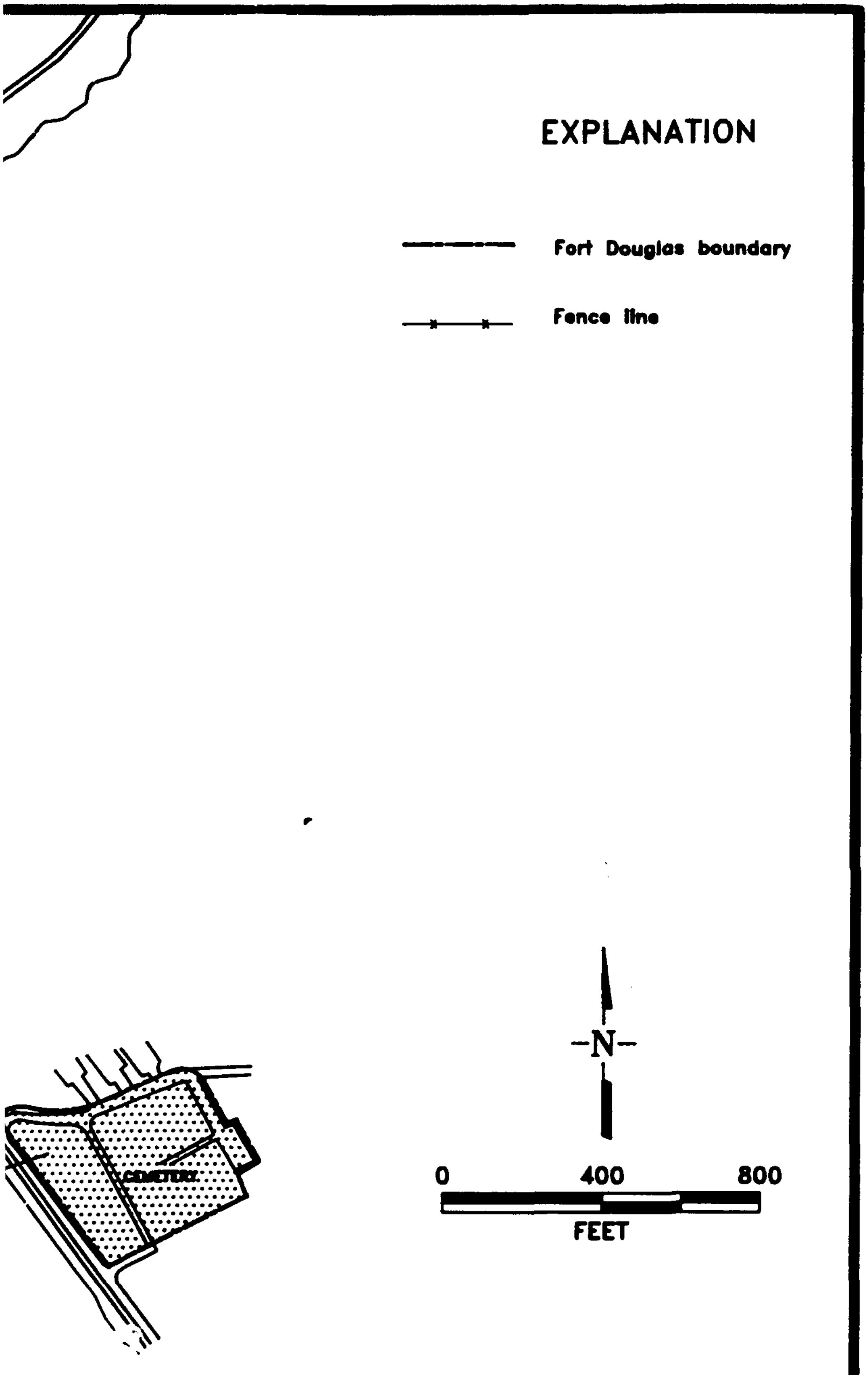
Figure 1-1


Excessed Area
PARADE GROUND
OFFICERS CIRCLE
WASATCH DRIVE
RED BUTT

1


STORAGE YARD
Swimming Pool
RED BUTTE CREEK
CEMETERY
Retained Area
Date:

2



R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants

Site Plan
Fort Douglas

Prepared for:
U.S. Army Corps of Engineers
USATHAMA

Date: June 1991 | Figure 1-2

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1.1 SITE HISTORY

Fort Douglas was established as Camp Douglas on October 26, 1862, near Salt Lake City, Utah, primarily to guard the Overland Mail route from hostile Indians and protect the lines of communication that linked the East and West Coasts. In addition, the presence of the camp served to quell any opposition to the federal government from the Mormon settlers. The camp was officially redesignated as Fort Douglas in 1878. In the first 50 years of the 20th century, Fort Douglas was used to garrison troops, house prisoners-of-war, and serve as headquarters for military units.

Original site boundaries included approximately 2,560 acres. Additional land acquisitions occurred primarily between 1867 and 1909 when Fort Douglas reached a maximum of approximately 7,900 acres.

The first structures at Fort Douglas were hastily constructed primarily of logs or adobe. In the 1870's, most of the original buildings were replaced with locally quarried red sandstone buildings, many of which remain intact today. Additional building programs were implemented primarily between 1904 and 1910, from 1928 through the 1930's, and in 1941.

In 1948, activities at Fort Douglas were curtailed to the point that the U.S. Government decided to turn over a large portion of Fort Douglas to the War Assets Administration for transfer of the property. Since this time, Fort Douglas has been used as headquarters for Reserve and National Guard units and a support detachment for military activities in the region. The present acreage of Fort Douglas is approximately 119 acres. Previously excessed properties have been transferred primarily to other government agencies and the University of Utah.

1.2 FACILITY DESCRIPTION

The approximately 119-acre installation includes 117 structures, including 36 housing structures containing 61 housing units. One hundred are of permanent construction (red brick, sandstone, or concrete), in good to excellent condition, and structurally sound with an estimated life of 50 more years with proper and timely maintenance (Dames and Moore, 1991).

Approximately 36 acres of Fort Douglas, including the 4-acre post cemetery have been entered in the National Register of Historic Places. In addition, an area encompassing approximately 49 acres (incorporating most of the National Register district but excluding the cemetery) has been upgraded

to the status of a National Historic Landmark, and additional buildings were identified as historically significant.

The approximately 51-acre area to be excessed includes 69 structures (Figure 1-2). The type of structures are summarized as follows:

- Fort Douglas Military Museum;
- Administrative office building;
- Thirty-six family housing structures, containing 61 housing units;
- Three family housing structures, currently used as administrative offices;
- Eighteen detached garages;
- A chapel;
- An Officers Club, used as a community and family center;
- A Noncommissioned Officers (NCO) Club;
- An office building;
- A former gas valve building;
- A latrine;
- A swimming pool with an associated water treatment building and bath house; and
- A bandstand.

Each housing unit is identified by the building number and by a letter (a, b, or c) designating the position of the unit. The units are labeled from left to right, as identified when facing the front of the building.

The structures were constructed primarily between 1874 and 1942. The gas valve building, now vacant, was constructed in 1954. Eight of the detached garages were built in 1972. A swimming pool that was rebuilt in 1988 is also to be excessed. Much of the area to be excessed is within the National Historic Landmark area, and most of the buildings are included in the National Register of Historical Places.

1.3 ASBESTOS CHARACTERISTICS

ACMs are suspected to be present in every building in the area to be excessed. The buildings were primarily constructed between 1874 and 1942. Before 1945, asbestos was used primarily as thermal system insulation (TSI) to insulate pipes or boilers. Between 1945 and 1970, asbestos was used in hundreds of products, including cement panels or wallboard (transite), floor and ceiling tiles, surfacing materials, roof felting or shingles, and outdoor siding.

Asbestos is a naturally occurring mineral. Asbestos crystals form long, thin fibers. When rock containing asbestos is processed, the asbestos divides into numerous microscopic fibers. Inhalation of asbestos fibers can cause adverse health effects, resulting in asbestosis, a scarring of the lung; lung cancer, a malignant tumor of the bronchi covering; and mesothelioma, a cancer of the lining of the chest or the lining of the abdominal wall.

ACMs can be distinguished as nonfriable or friable. Friable ACMs can be crushed to a powder by hand pressure. Fibers may be readily released to the air from friable ACM; however, nonfriable ACM can also release fibers if damaged or disturbed.

1.4 REGULATORY REQUIREMENTS

Federal regulations pertaining to asbestos are included under the National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart M, the National Emission Standard for Asbestos; and the Asbestos Hazard Emergency Response Act of 1986 (AHERA), which addresses the identification, evaluation, and control of ACMs in elementary and secondary schools. Regulation of asbestos exposure in the occupational environment is the responsibility of the Occupational Safety and Health Administration (OSHA).

Utah state regulations administered by the Utah Bureau of Air Quality include Asbestos Work Practices and Contractor Certification, Section 8, Utah Air Conservation Regulations. Under these

regulations, specific work practices are to be followed and persons handling ACMs or education agencies responsible for these persons are required to be certified. The Utah Occupational Safety and Health Division administers standards for occupational exposure to asbestos. These regulations are the same as the OSHA standards. The Salt Lake City-County Health Department has local asbestos regulations and requires certification by the county for persons involved in asbestos projects.

The asbestos survey at Fort Douglas will be conducted in accordance with the applicable regulations described above as well as standards in the U.S. Army Technical Manual for asbestos control (TM5-612). All personnel involved in the survey will be certified as required.

OSHA requirements for general industry are published in 29 CFR 1910.1001. The occupational standard establishes permissible exposure limit (PEL) of 0.2 fibers per cubic centimeter (f/cc) of air averaged over an 8-hour day, and an action level of 0.1 f/cc averaged over 8 hours. If the action level is exceeded, compliance activities such as air monitoring, employee training, and medical surveillance generally are required. To the extent feasible, engineering and work practice controls generally are used to reduce employee exposure to below PEL. TB MED-513 and AR 200-1, Chapter 10, provide specific exposure guidance for Army personnel. As stated in TB MED-513, soldiers, employees, and family members will not be nonoccupationally exposed to airborne concentrations of asbestos that exceed the greater of the outdoor ambient concentration or the minimum level detectable by the method specified in 29 CFR 1910.1001.

1.5 PRELIMINARY INVESTIGATIONS

Previous asbestos investigations at Fort Douglas have been limited in scope. As part of an Enhanced Preliminary Assessment (PA), some of the buildings were surveyed for asbestos. Photographs were taken; however, no samples were collected. Prior to the PA, the Army sampled suspected ACMs from four buildings. These samples were analyzed and confirmed the presence of asbestos. An initial site visit conducted as part of the EI/AA in March, 1991, indicated that suspected ACMs were present in most of the buildings entered.

1.5.1 PRELIMINARY ASSESSMENT

The PA identified asbestos as requiring environmental evaluation (Weston, 1989). Exposure to asbestos could occur through the air pathway, primarily to occupants of the Fort Douglas buildings. During a site visit conducted as part of the PA, four of the family housing structures were surveyed

(Buildings 8, 17, 25, 62), and all were suspected to contain asbestos insulation around hot water pipes located in the basement. In some areas, insulation was observed to be cracked and broken. The NCO Club, Officers Club, bath house, water treatment building, and swimming pool were also surveyed. Asbestos insulation was suspected to be present on hot water pipes in the NCO Club, Officers Club, and the swimming pool bath house. The PA reported that asbestos siding may be present in the chapel and asbestos may be a component of the shingles of some buildings, including Building 20 and a storage area near Building 234.

Prior to the PA, the Army conducted limited sampling in four buildings in the area of Fort Douglas to be excessed (Buildings 8, 15A, 18C, and 32) and confirmed the presence of asbestos in material covering the pipes in all four buildings (Weston, 1989). As part of an ongoing program at Fort Douglas, the pipe insulation in some of the buildings has been wrapped to reduce the potential for release of asbestos. A summary of the structures in the area of Fort Douglas to be excessed and type of ACMs suspected in these structures is presented in Table 1-1.

1.5.2 INITIAL EI/AA SURVEY

As part of the planning process for the asbestos program, an initial site visit and building walkthrough were conducted. Sixteen buildings were entered; suspected ACMs were observed in fifteen of the buildings. Types of suspected ACM observed included pipe and duct insulation, sprayed and pressed fiber ceilings, siding, wall board, shingles, and floor tile. Table 1-2 summarizes the locations and types of suspected ACMs in each building.

Table 1-1 Summary of Preliminary Asbestos Surveys Reported in the PA

Structure Number	Current Use	Date of Construction	Number of Housing Units	Square Footage of Structure	Type of Suspected ACM
1	NCO Quarters	1910	2	5,918	NS
2	NCO Quarters	1884	2	8,196	NS
3	Officers Quarters	1931	1	4,052	NS
4	Administrative Offices	1875	-	8,144	NS
5	Administrative Offices	1904	-	17,640	NS
6	Officers Quarters	1875	2	7,798	NS
7	Officers Quarters	1875	2	9,456	NS
8	Officers Quarters	1875	2	9,532	Pipe insulation*
9	Officers Quarters	1875	2	9,422	NS
10	Officers Quarters	1875	2	9,348	NS
11	Officers Quarters	1875	2	9,422	NS
12	Officers Quarters	1875	2	9,422	NS
13	Officers Quarters	1875	2	9,584	NS
14	Officers Quarters	1875	2	9,362	NS
15	Officers Quarters	1875	2	8,172	Pipe insulation*
16	NCO Quarters	1884	2	9,104	NS
17	NCO Quarters	1884	2	9,104	Pipe insulation
18	Officers Quarters	1875	3	9,996	Pipe insulation*
19	Officers Quarters	1875	3	8,223	NS
20	Officers Quarters	1875	1	8,501	Roof shingles
21	Officers Quarters	1931	1	4,186	NS
22	Officers Quarters	1931	1	4,186	NS
23	Officers Quarters	1931	1	4,186	NS
24	Officers Quarters	1931	1	4,186	NS
25	Officers Quarters	1931	1	4,186	Pipe insulation
31	Administrative Offices	1876	-	8,146	NS
32	Museum	1876	-	9,693	Pipe insulation*
37	Offices	1918	-	417	NS
39	Latrine	1876	-	600	NS
41	Former Gas Valve Building	1954	-	207	NS
48	Post Chapel	1884	-	2,704	Siding
49	Officers Club	1876	-	10,054	Pipe insulation
50	Detached Garages	1932	-	590	NS
51	Detached Garages	1931	-	878	NS
52	NCO Quarters	1900	1	2,309	NS
53	NCO Quarters	1910	1	2,260	NS
54	NCO Club	1933	-	7,722	Pipe insulation
55	Administrative Offices	1874	-	2,181	NS
56	NCO Quarters	1916	2	3,916	NS
57	NCO Quarters	1916	2	4,028	NS

* Confirmed by sampling.
NS - Not Surveyed

Table 1-1 Summary of Preliminary Asbestos Surveys Reported in the PA (continued)

Structure Number	Current Use	Date of Construction	Number of Housing Units	Square Footage of Structure	Type of Suspected ACM
58	NCO Quarters	1930	2	3,590	NS
59	NCO Quarters	1917	1	1,409	NS
60	NCO Quarters	1930	2	3,216	NS
61	NCO Quarters	1891	1	1,859	NS
62	NCO Quarters	1891	1	1,878	Pipe insulation
63	NCO Quarters	1891	1	1,878	NS
64	NCO Quarters	1930	2	3,216	NS
65	NCO Quarters	1930	2	3,216	NS
66	NCO Quarters	1900	2	4,396	NS
69	Detached Garages	1917	-	473	Siding
350	Bath House	1937	-	2,034	Pipe insulation
351	Water Treatment Building	1937	-	64	NS

NS - Not Surveyed

Table 1-2 Examples of Suspected Asbestos Containing Material (ACM) Observed During Initial EI/AA Site Visit

Building No.	Type	Suspected ACM Observed
4	Marines/Educ.	Pipe insulation, wallboard
5	Readiness Group	Fiber ceilings, pipe insulation
12b	Duplex	Pipe insulation
18c	Single	Pipe insulation
20	Single	Pipe insulation, shingles
22	Single	Pipe insulation
32	Museum	Pipe insulation
48	Chapel	Siding
49	Military Club	Pressed fiber ceiling, wallboard, sprayed ceiling, pipe insulation, duct insulation
54	Former NCO Club	Sprayed ceilings, pressed fiber ceilings, siding, pipe insulation
55	Single	Floor tile
58a	Duplex	Pipe insulation
59	Single	Pipe insulation
64b	Duplex	Floor tile, pipe insulation
350	Bath House	None
569	Garage	Siding

2.0 DATA COLLECTION

The survey, sampling, and analysis program has been designed to locate and identify ACMs and assess the extent, condition, and potential for disturbance. Resulting data will be used to assess the potential for exposure to asbestos fibers and the need for abatement. The asbestos field program will be conducted by personnel certified by the EPA and Salt Lake City and County. R.L. Stollar and Associates (Stollar) will be certified by the Utah Department of Health as the project operator. The program is designed in accordance with AHERA and Army methods and procedures. When the regulations differ, the more conservative approach will be used for the Fort Douglas program.

Fifty-two structures will be surveyed for asbestos. The structures are listed in Table 2-1; their locations are identified on Figure 2-1.

2.1 PRELIMINARY TASKS

Prior to beginning the data collection, building plans will be reviewed, and Fort Douglas occupants will be notified of the asbestos program through the Fort Douglas Directorate of Engineering and Housing (DEH). Building records will be reviewed for the specification of ACMs. Arrangements will be made with the Fort Douglas DEH to coordinate access to the buildings.

All personnel conducting the survey and sampling will complete necessary certifications. Certification documents for personnel that will be involved in the Fort Douglas asbestos program are included in Appendix A. Applications for Utah Department of Health/Bureau of Air Quality and Salt Lake City-County Health Department certifications have been submitted. Copies of the work plan packages including the Asbestos Sampling Plan, the Technical Plan, Quality Assurance Project Plan (QAPP), the Health and Safety Plan, and TM5-612 will be distributed to all field personnel. An orientation will be conducted to familiarize the team with the site, the sampling and survey program, and the QA and health and safety protocols established for the investigation. Each sampling team will be issued kits containing all necessary equipment. Table 2-2 lists the equipment that will be included in each sampling kit.

Table 2-1 Asbestos Survey and Sampling Summary

Structure Number	Current Use	Date of Construction	Number of Housing Units	Square Footage of Structure
1	NCO Quarters	1910	2	5,918
2	NCO Quarters	1884	2	8,196
3	Officers Quarters	1931	1	4,052
4	Administrative Offices	1875	-	8,144
5	Administrative Offices	1904	-	17,640
6	Officers Quarters	1875	2	7,798
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12	Officers Quarters	1875	2	9,422
13	Officers Quarters	1875	2	9,584
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15	Officers Quarters	1875	2	8,172
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17	NCO Quarters	1884	2	9,104
18	Officers Quarters	1875	3	9,996
19	Officers Quarters	1875	3	8,223
20	Officers Quarters	1875	1	8,501
21	Officers Quarters	1931	1	4,186
22	Officers Quarters	1931	1	4,186
23	Officers Quarters	1931	1	4,186
24	Officers Quarters	1931	1	4,186
25	Officers Quarters	1931	1	4,186
31	Administrative Offices	1876	-	8,146
32	Museum	1876	-	9,693
37	Offices	1918	-	417
39	Latrine	1876	-	600
41	Former Gas Valve Building	1954	-	207
48	Post Chapel	1884	-	2,704
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51	Detached Garages	1931	-	878
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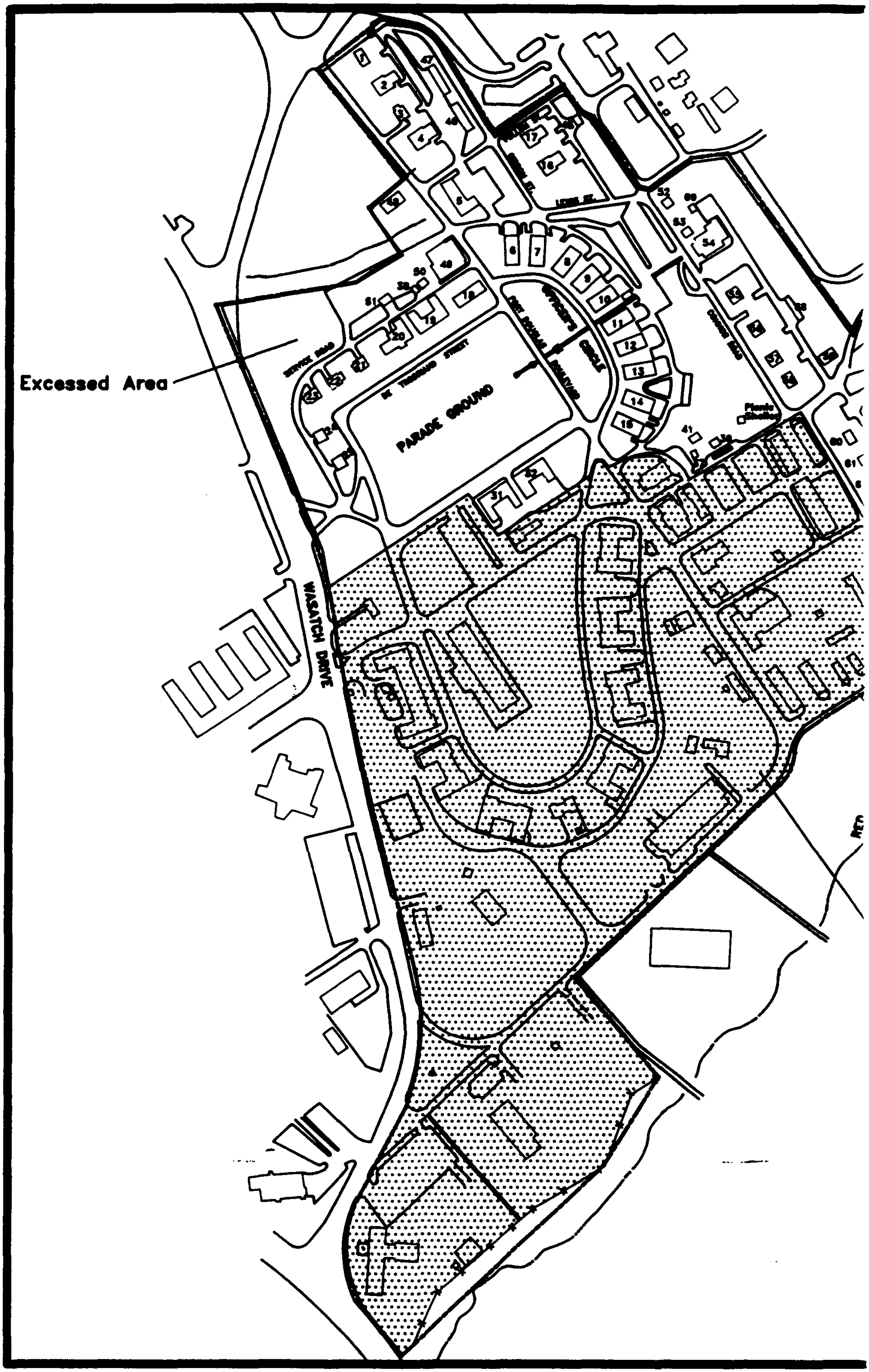
57	NCO Quarters	1916	2	4,028
58	NCO Quarters	1930	2	3,590
59	NCO Quarters	1917	1	1,409
60	NCO Quarters	1930	2	3,216
61	NCO Quarters	1891	1	1,859

Table 2-1 Asbestos Survey and Sampling Summary (continued)

Structure Number	Current Use	Date of Construction	Number of Housing Units	Square Footage of Structure
62	NCO Quarters	1891	1	1,878
63	NCO Quarters	1891	1	1,878
64	NCO Quarters	1930	2	3,216
65	NCO Quarters	1930	2	3,216
66	NCO Quarters	1900	2	4,396
69	Detached Garages	1917	-	473
350	Bath House	1937	-	2,034
351	Water Treatment Building	1937	-	64



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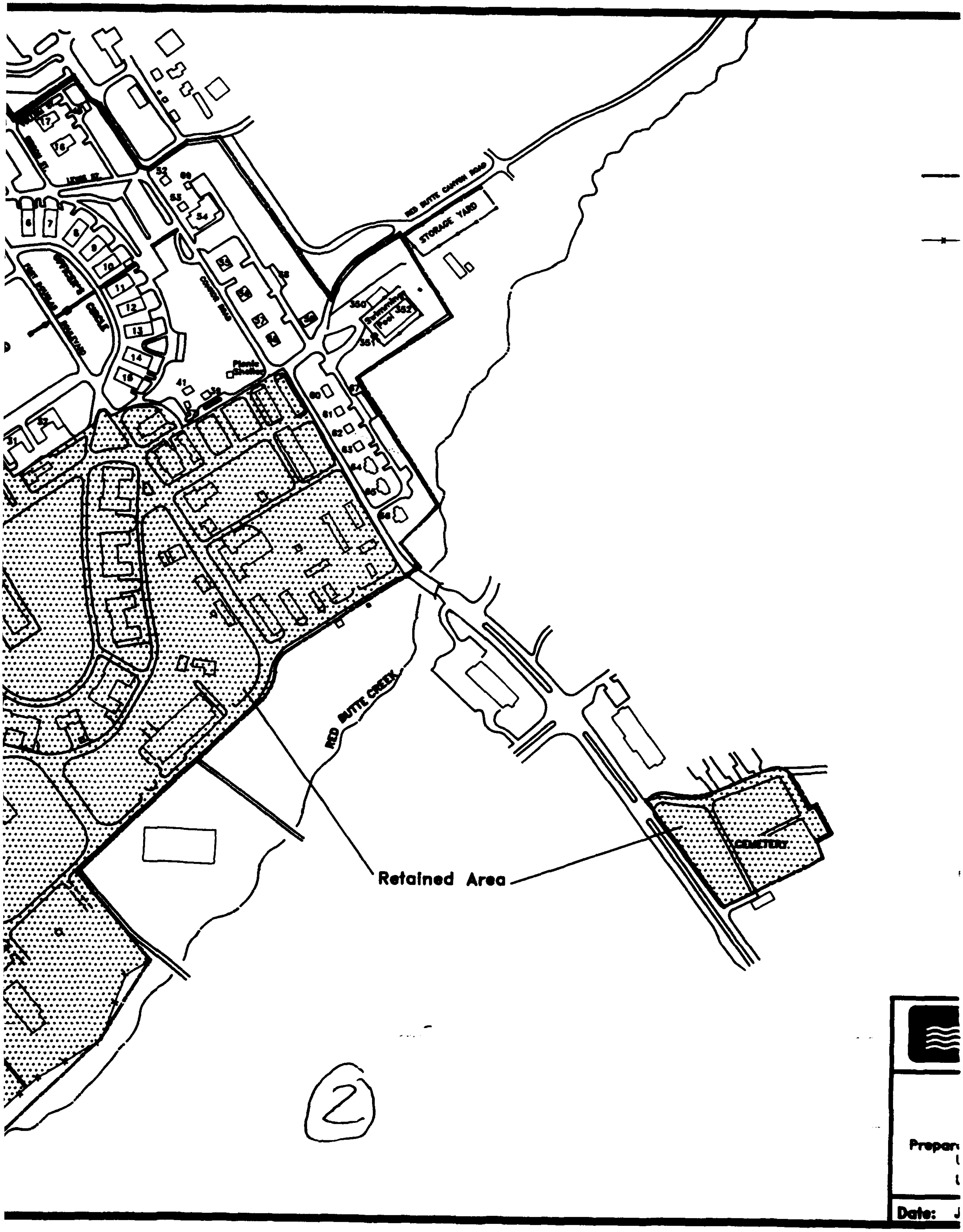
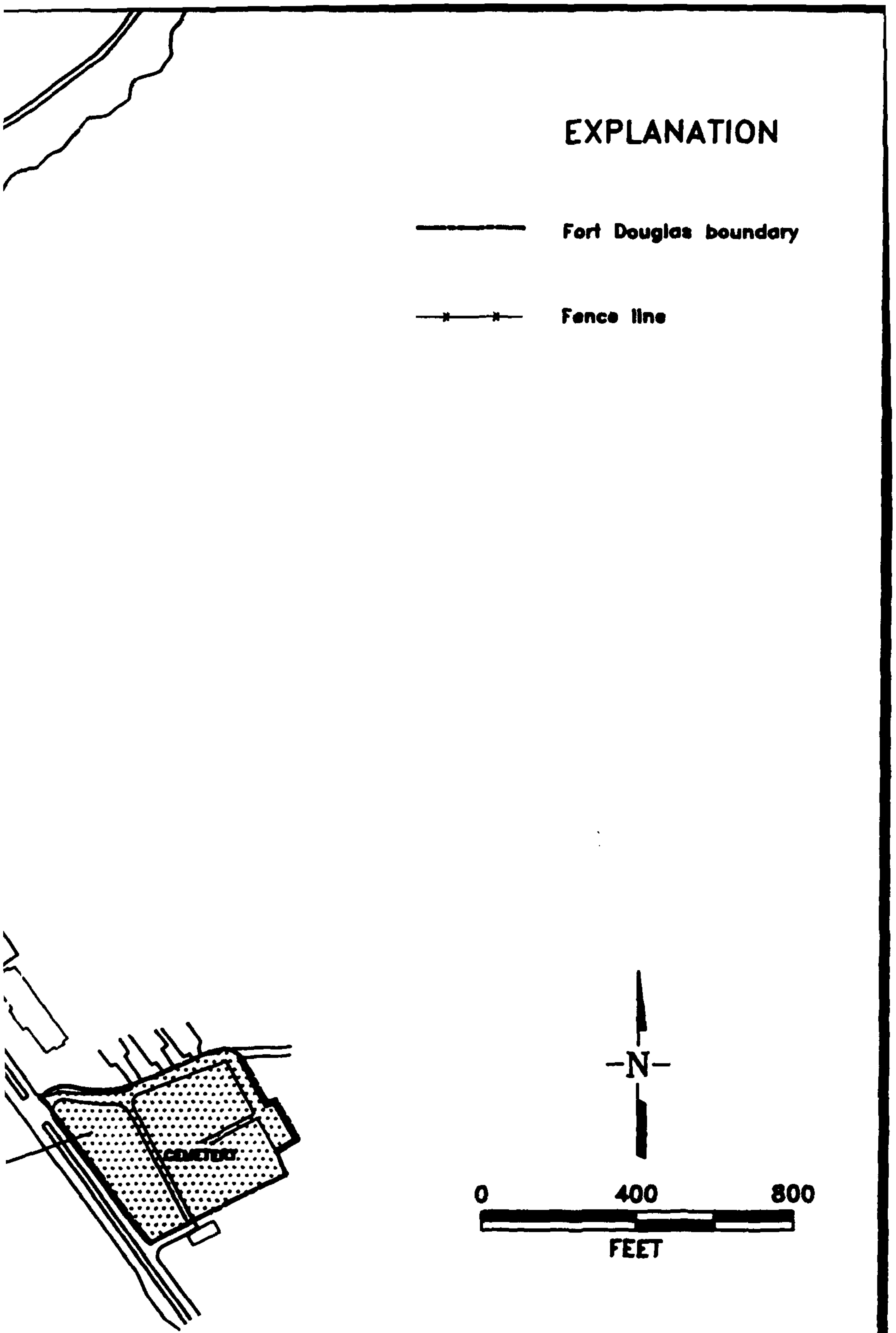


RED BUTTE CANYON ROAD
STORAGE YARD
Swimming Pool
Picnic Shelter
RED BUTTE CREEK
Retained Area
CEMETERY
2



R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants

Structure Locations
Fort Douglas

Prepared for:
U.S. Army Corps of Engineers
USATHAMA

Date: June 1991	Figure 2-1

Table 2-2 Contents of Sampling Kit

- Plastic squeeze bottle containing water and a wetting agent. The wetting agent can be a 5 percent soap solution (a few drops of liquid soap in water).
- Plastic bags for sample collection.
- Tweezers, cork bores, and knives as aids for taking a sample.
- Container labels for identifying samples.
- Sample log, assessment, survey data, chain-of-custody forms.
- Logbook.
- Tape measure, clipboard, and pens.
- Calculator.
- Paper towels for wiping sampling tools clean.
- Caulking gun and compound for filling holes after sample extraction.
- Duct tape.
- Marker with indelible ink.
- Disposable latex gloves for hand protection.
- Plastic bags for disposal of excess debris and used protective equipment.
- Protective eyewear for overhead sampling.
- Tyvek coveralls.
- Disposable drop cloth.
- Half-face piece air purifying respirator with high efficiency particulate air. (HEPA) filter cartridges.
- Ladder for sampling out-of-reach areas.
- Flashlights.
- Building keys.
- Camera for photographing suspect areas.

2.2 SURVEY

AHERA requires the inspection and assessment of asbestos containing building materials (ACBMs) excluding materials installed outside a building, such as roofing felt and siding, and all fabric materials. Army regulations do not make this distinction and require inspection of all ACMs. Both regulations require that all areas of each building be inspected to identify locations of all friable and nonfriable suspected ACM (or ACBM), and determine friability by touching the suspected material. According to both regulations, an assessment of the physical condition of friable known or assumed ACM (or ACBM) will be made. Army regulations also require the identification of the location and condition of nonfriable ACM (TM5-612, Chapter 5, paragraph 5-2.a.).

Floor plans will be used to divide building areas into functional spaces. Functional spaces are defined for this study as spacially distinct as units within a building which can contain human populations and/or spaces designed to transport air to or from human populations. Functional spaces include mechanical spaces such as attics, air plenums, elevator shafts, and machine rooms; common areas including hallways, stairwells, meeting rooms, garages; living/working areas such as offices, classrooms, rooms in an apartment or house; and special use areas such as kitchens, dining rooms, laundry rooms, athletic facilities. Each functional space within each building will be assigned a unique number for the purposes of the survey.

The survey will proceed by beginning at the lowest floor and working up through the highest floor. Every functional space will be examined to look for suspect materials. Three types of ACMs may be present: (1) thermal system insulation (TSI), including pipe wrap, all block insulation, all cements and pipe-fitting muds, and all gasket materials; (2) surfacing materials that include textured walls, ceilings, and structural members with sprayed or troweled on ACM and plaster and fireproofing insulation; (3) miscellaneous materials, which primarily include floor and ceiling tiles, transite wallboard and exterior materials such as roofing felt and siding. TSI that has retained its structural integrity and has an undamaged protective jacket or wrap will be treated as nonfriable.

The survey will be nondestructive in nature. Structural units such as walls or floors will not be removed to check for ACM; however, moveable objects such as ceiling tiles and furniture will be displaced when needed in order to completely examine each functional space. All potential ACM surfaces will be examined for friability. The location and description of all suspect materials assumed to be ACM will be recorded. The approximate amount of the material will be determined, and the condition and potential for disturbance assessed. This information will be recorded on an assessment

form. Figure 2-2 is an example assessment form. The location of all suspect materials will be delineated on floor plans.

Homogeneous areas for suspect materials will also be delineated. A homogeneous area is defined as an area containing materials that are uniform in texture and appearance, were installed at the same time, and are unlikely to consist of more than one type or formulation of mix. If several floors or buildings have homogeneous materials, these may be grouped as a single homogeneous area. An ACM survey data sheet, similar to that shown in Figure 2-3, will be filled out for each homogeneous sampling area.

2.3 SAMPLING

AHERA requires bulk sampling of friable suspect ACBM or the assumption that the suspected material contains asbestos. Army regulations require the sampling of both friable and nonfriable ACM. For the Fort Douglas program, bulk samples will be collected from suspect ACMs after delineating homogeneous areas.

For each sampling area, a diagram will be prepared that shows all suspect ACM in the sampling area and includes building number, description of the sampling area and location sampled, sample identification numbers, name of the inspector, and dates of inspection, sample collection, and diagram preparation. Sample locations will be marked with the sample identification number, and the location will be photographed. Random locations will be sampled for each homogeneous area. The number of samples collected from each homogeneous area will depend on the size of the area and the type of ACM (surfacing materials, TSI, miscellaneous materials). This number will be calculated following AHERA guidelines as discussed in the following sections. Approximately 664 bulk samples will be collected during the asbestos field program. A unique sample number will be assigned to each sample location. This number will be recorded on the sampling area diagram and on a log for bulk samples (Figure 2-4).

Sampling techniques will be designed to minimize the release of asbestos fibers into the air. Prior to sampling, the location will be wetted. Once saturated, the sample will be cut from areas where the ACM is exposed or damaged, edges of floor or ceiling tiles, or from small holes in protected insulation near seams. After sampling, the friable area will be encapsulated using tape, caulking, or acrylic/adhesive. During sampling, respirators with HEPA filters will be utilized, and latex gloves, safety goggles, and Tyvek coveralls will be worn to minimize exposure to the asbestos. Uncoated

BASE: Fort Douglas   BLDG NO:_____   INSPECTOR:__________   DATE:_____

FUNCTIONAL SPACE:__________   TYPE OF SUSPECT MATERIAL:__________   Form # _

SURFACING____ TSI____ OTHER____

******** Part I: DAMAGE/RISK ********

- Physical Damage, Visible evidence:_____(5) High;_____(4) Moderate;_____(2) Low;_____(1) Minimal;_____(0)None
- Water Damage: ____(3) Yes; ____(0) No
- Proximity to Items for Repair. If both a. and b. apply score the one with the highest rating. (Max 3 pts). How far? :

"a". Sprayed or Trowelled-on:____(3) <1 ft or ceiling panel contam.; ____(2) $1 \leq ? < 5$ ft;____(1) ≥ 5 ft; ____(0) ≥ 5 ft No rout. maint.

"b". Pipe, Boiler, or Duct Insulation, Damage by routine maint. ? : ____(3) ceiling panel contam.; ____(1) Yes; ____(0) No

- Type of Mat'l:____(0-4) Other Friable mat'l;____(1) Boiler and/or pipes;____(3) HVAC;____(4) Ceilings or walls
- Potential for Contact: "<10 ft" ____(8) High;____(5) Medium;____(2) Low; "$\geq$10 ft" ____(5) High; ____(3) Medium;____(0) Low
- Asbestos Content, % with highest prob: ____(1) $1 < \% \leq 30$;____(3) $30 < \% \leq 50$;____(5) >50%; NO HAZARD all samples no asbestos

Damage (D) Total__________

******** Part II: EXPOSURE ********

- Friable: ____(6) High;____(3) Moderate;____(1) Low
- Area of Visible Mat'l: ____(0) <10 ft^2;____(1) $10 \leq ft^2 < 100$;____(2) $100 \leq ft^2 < 1000$;____(3) ≥ 1000 ft^2
- Walls: ____(4) Rough; ____(3) Pitted;____(2) Moderate;____(1) Smooth
- Ventilation (max 7 pts): ____(5) Interior supply;____(2) Interior return;____(1) Air supply-Fiber potential;____(0) None
- Air Movement Affecting Mat'l: ____(5) Routine turbulent or abrupt air mvmt;____(2) Exposed to percept air;____(0) No percept air
- Activity: ____(5) High-constant vibes;____(2) Medium-occasional vibes;____(0) Low-admin office, classroom, waiting room, etc.
- Floor: ____(4) Carpet;____(2) Seamed or rough surface;____(1) Smooth continuous surface;____(0-4) Unique situations
- Barriers. If both a. and b. apply, score theone withthe highest rating. check all that apply (Max of 4 pts):

"a". Sprayed or trowelled-on on ceiling or walls: ____(1) Suspend ceiling;____(2) Encapsulation;____(3) Railing or wire;____(4) None

"b". Pipe, Boiler, Duct, or Other Mat'l: ____(1) $\leq 25\%$;____(2) $25 < \% \leq 50$;____(3) $50 < \% \leq 75$;____(4) $75 < \% \leq 100$

- Population: ____(1)$\leq$9 or for corridors;____(2)$10 \leq Pop \leq 200$;____(3)$201 \leq Pop \leq 500$;____(4)$501 \leq Pop \leq 1000$;____(5)$\geq$1001 or med or youth

Exposure (E) Total__________

Sample Numbers (Air & Bulk):__________

Figure 2-2 Physical Assessment Data Form

FACILITY: Fort Douglas BUILDING: ______ OPERATION: ______

EVALUATOR: ______ HOMOGENEOUS MATERIAL ______ DATE: ______

FUNCTIONAL SPACE LOCATIONS ______ FORM #: ______

ACM APPLIED TO:

☐ Ceiling

Type
- ☐ Concrete
- ☐ Tile
- ☐ Metal Deck
- ☐ Concrete Joists & Beams
- ☐ Corrugated Steel
- ☐ Suspended Metal Lathe
- ☐ Suspended Lay-in Panels
- ☐ Steel Beam or Bar Joists

Shape
- ☐ Flat
- ☐ Folded Plate
- ☐ Dome
- ☐ Barrel
- ☐ Other (draw)

☐ Pipe ______

INSULATION

	Loose fill	Blanket	Thermal Brick	Sheeting	Other
☐ Boiler					
☐ Tank					
☐ Ductwork					

☐ Structural members ______

☐ Wall ______

☐ Other ______ (Floortile, Shingles, Roofing Felt, Wall Board, Panel, etc.)

ENVIRONMENTAL CONDITIONS:

Type of floor ☐ Concrete ☐ Tile ☐ Wood ☐ Carpet ☐ Other ______

Type of lighting ☐ Surface ☐ Suspended ☐ Recessed

No. of Lights ______

Type of ventilation system ______

ACM debris on floor, furniture, equipment, or other surfaces ______

☐ No ☐ Yes If yes, describe ______

Confirmation bulk sample no. ______ Results ______

ACM is subject to direct air stream or is located in proximity to air plenum

☐ No ☐ Yes If yes, describe ______

Machinery or equipment in area ☐ No ☐ Yes

If yes, describe ______

SPECIAL CONSIDERATIONS:

Utility maintenance frequency ______

Life-cycle projection for structure ______

Renovation schedule (past, present, future - dates) ______

Utilization by public ______

Other unique characteristics ______

DESCRIPTION OF MATERIAL:

	Line	Pipe	Boiler	Tank	Ductwork	Structural	Walls	Other
Type of ACM								
[1] Sprayed-on [2] Troweled-on [3] Air Cell [4] Block Type [5] Cementitious [6] Other								
Sq. or linear feet								
Thickness (in.)								
Diameter (in.)								
No. of runs								
No. of fittings								
Condition: Good/Fair/Poor								
Friability: Non/ Low/Moderate/High								
Uniformity: Yes/No								
Water damage: Yes/No/Source								
Vibration damage: Yes/No/Source								
Adhesion to underlying surface: Good/Moderate/Poor								
Texture: Fibrous/Cementitious/ Granular/Concrete-like								
Is ACM covered? Yes/No/Describe Cloth, Paper, Paint, etc.								
Is covering uniform? Yes/No/Describe								
Bulk sample no. 1								
no. 2								
no. 3								
Type asbestos								
% Asbestos								
Other comments								

AREA OCCUPANT/USER ACCESSIBILITY:

	NO	YES	DESCRIBE
Vulnerable to human activity			
Evidence of contact			
Material exposed			
Physical barriers			

User activities ______

SAMPLE NUMBERS: ______

Figure 2-3 ACM Survey Data Sheet

LOG FOR BULK SAMPLES

Installation Fort Douglas

Sampler Name ______________

Building ______________

Type of Homogenous Material				Sample ID Number	Date/Time Sampled	Sample Location		Extent (Functional Space Locations)	Physical Condition		Footage (linear or square)	Sampler Initials
Description	TSI	SM	Misc			Func. Space	* Description		Fri-able (Y/N)	Description		

SM - Surfacing Material
TSI - Thermal Surface Insulation
* Include coordinates (x,y) where x is the number of feet down from the top of a specified wall or corner and y is the number of feet in a direction perpendicular to the same wall or corner.

ASP-FIG.2-4

Tyvek coveralls also will be required and utilized during the survey. All personal protection and sampling equipment and sample locations will be decontaminated as specified in TM5-612, Chapter 5, paragraph 5-3.d.(6). Wastes generated by the field investigation will be containerized and disposed of at an approved disposal facility (TM5-612, Chapter 9, paragraph 9-4).

2.3.1 SURFACING MATERIALS

Surfacing materials will be grouped into homogeneous sampling areas. The number of samples per homogeneous area is determined based on the square footage of the homogeneous area. A sufficient number of samples will be collected to adequately characterize the extent of ACM in a particular building or location. The number of surfacing material samples to be collected from each homogeneous area will be determined following AHERA guidelines:

Size of the Sampling Area	Minimum Number of Samples
<1,000 sq ft	3
>1,000 and <5,000 sq ft	5
>5,000 sq ft	7

Sample locations will be selected following AHERA random sampling guidelines.

2.3.2 THERMAL SYSTEM INSULATION

Sampling of TSI also will be performed based on its distribution in homogeneous areas. Each type of insulation will be considered as a separate homogeneous area. The number and locations of samples from each type of TSI will vary. A minimum of one bulk sample will be collected from patched areas less than 6 linear or square feet. For TSI greater than 6 linear or square feet, at least three random samples of each type of TSI will be collected from each homogenous area of TSI. The samples will be collected from random locations; however, locations will be selected to minimize potential damage to the TSI.

2.3.3 Miscellaneous Materials

Bulk samples of miscellaneous suspected ACM will be collected from homogeneous areas to determine if the material is ACM. Sample locations will be selected to minimize damage to the material. Miscellaneous materials that are easily identified as ACMs, such as transite will not be sampled.

2.4 Analysis

The samples will be analyzed by a selected USATHAMA approved laboratory, Environmental Science and Engineering, Inc. (ESE). This laboratory is accredited by the American Industrial Hygiene Association (AIHA), has been a participant in the EPA bulk asbestos sample QA program, and is currently a participant in the National Voluntary Laboratory Accreditation Program (NVLAP). The method of analysis for asbestos is based on EPA 800/M4-82-020. USATHAMA does not certify procedures for asbestos analysis. Identification of asbestos fiber bundles will be made using polarized light microscopy. Results will be reported in percent asbestos.

2.5 Quality Assurance/Quality Control

Sample identification, labeling, custody, and shipping procedures specified in the Quality Assurance Project Plan (QAPP) for Fort Douglas will be followed.

Quality control (QC) samples will be collected to confirm the results of the laboratory. The QC samples will consist of duplicate samples, collected adjacent to an investigative sample. One QC sample will be collected per building or per 20 investigative samples, whichever is larger. The sample numbers and chain-of-custody forms will not identify the duplicate samples, so that the laboratory's objectivity will not be compromised.

2.6 Data Management

Data generated from sample collection and survey observations will be managed in accordance with USATHAMA data management procedures. Data generated from the asbestos program will include analysis data from the laboratory subcontractor and results of ACM surveys. Bulk sampling data will be reported by the laboratory in percent asbestos. These data will be entered under method number 99 into the Installation Restoration Data Management System (IRDMS) by the laboratory and reviewed by Stollar. Sample data will be identified by sample number and by the coordinates of the

center of the sampled building. All field-generated data will be entered in logbooks, on field log forms and on sample area drawings. Computerized field data will be entered by Stollar into the IRDMS. All original logbooks and hard copy of chemical/survey data will be supplied to USATHAMA.

3.0 ASSESSMENT

The asbestos survey, sampling, and analysis program is designed to provide data to assess the factors influencing asbestos fiber release, and, based on this data, the potential for personal exposure to asbestos, and the need, if any, for abatement. As discussed in Section 1.0, the assessment will focus on materials containing more than one percent asbestos by weight (ACMs). Information that will be evaluated includes factors related to current conditions of the ACM; potential for future damage, disturbance, or erosion; inherent friability of ACM; percent asbestos content; and number of usual occupants and duration of occupancy. An exposure analysis will consider all factors compiled during the survey and relate them to the potential for human exposure to ACM. The exposure analysis will result in recommended actions. The University of Utah will assume ownership of Fort Douglas; therefore, the assessment and exposure analysis will be directed toward projected users of the Fort Douglas buildings, including college students, faculty, and staff.

3.1 POTENTIAL FIBER RELEASE

Visual observation of the condition of the ACM will be used to assess the potential for a fiber release. If water or physical damage, deterioration, or delamination of the material is evident, then fiber release has occurred, is occurring, or is likely to occur. The appearance of the material and the presence of broken or crumbled material on horizontal surfaces indicates the possibility of fiber release. (TM5-612, Chapter 6, paragraph 6-1.b.)

Visible, highly accessible materials in areas frequently used or needing periodic maintenance are the most vulnerable to physical damage. Also in this category are materials subject to vibration from mechanical equipment, sound, or activities. ACM near a forced airstream is likely to suffer surface erosion. In addition, fibers released into an airstream may be transported to other parts of the building, possibly increasing exposure. Any planned changes in building use should also be considered when assessing potential fiber release. (TM5-612, Chapter 6, paragraph 6-1.b.)

3.2 EXPOSURE ANALYSIS

An exposure analysis will be conducted which considers all descriptive and quantitative factors (related to material condition, extent, etc.) compiled during the building asbestos survey and relates them to the potential for human exposure to ACM. (TM5-612, Chapter 6, paragraph 6-2.a.)

A recommended hazard assessment guide to be used for Army structures is included in this plan as Appendix B (Guide for Asbestos Hazard Assessment in U.S. Army Facilities, 1988). This plan will be used for the assessment. The assessment method is quantitative enough to provide a measure of hazard severity and allow the prioritization of facilities in terms of the need for corrective action; and provides a listing of factors not readily amenable to quantification, but which should be considered in the final development of correction action. (TM5-612, Chapter 6, paragraph 6-2.b.) The scheme is designed to apply to only to friable asbestos, to include either sprayed- or trowelled-on surfacing materials or pipe, boiler, and tank thermal insulation. Other nonfriable forms of asbestos containing material can be managed satisfactorily by an operation and maintenance program with abatement necessary only as part of facility alteration/repair, maintenance, or demolition.

3.3 DETERMINATION OF THE NEED FOR ABATEMENT

If a building contains ACM, the need for asbestos control or abatement beyond a special operation and maintenance program will be considered. The presence of ACM does not necessarily require abatement of ACM. Methods for determining whether abatement is necessary are detailed in TM5-612, Chapter 6, paragraph 6-3. The section also discusses the timing of abatement and the selection of abatement methods. The manual describes the factors which should be considered for abatement of surfacing materials; pipe, boiler and tank insulation materials; and other types of ACM.

3.4 SELECTION OF A CONTROL METHOD

Technical and economic factors will be considered in the selection of a control method. Technical considerations include the availability of replacement encapsulation or enclosure materials; compatibility of replacement equipment with the engineering design and function of the structure; ability of the facility to support the additional load of the encapsulant or the enclosure structure; and potential for constructing airtight enclosure structures to meet facility design and operating criteria. Economic considerations include the coordination of asbestos abatement with other construction activities; disruption of facility operations; and comparison of abatement cost with a special operation and maintenance program.

3.5 ASBESTOS REPORT

The asbestos report will contain the results of the asbestos survey. The results will be organized and presented by building. Each building subsection will include: 1) a building diagram with marked

sample locations; 2) survey data sheets; 3) a table of analytical results; and 4) an assessment discussion of the potential for personnel exposure, the need for abatement or control, recommended actions and costs.

4.0 REFERENCES

29 CFR 1910.1001, Asbestos, tremolite, anthophyllite, and actinolite, 1 July 1989.

U.S. Army Technical Manual No. 5-612 (TM5-612), Asbestos Control, Draft, 25 January 1989.

Technical Bulletin Medical (TB MED) 513, Guidelines for the Evaluation and Control of Asbestos Exposure, 15 December 1986.

Guide for Asbestos Hazard Assessment in U.S. Army Facilities, Draft, 28 November 1988, CERL Environmental Engineering Team, Bernie Donahue.

Weston, R.F., Inc. (Weston), 1989. Enhanced Preliminary Assessment, Task Order 2, Fort Douglas, Salt Lake City, Utah. Prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland.

APPENDIX A

CERTIFICATION DOCUMENTS

The

American Board of Industrial Hygiene®

ABIH®

AMERICAN BOARD OF INDUSTRIAL HYGIENE®

organized to improve the practice of Industrial Hygiene
proclaims that

Richard L. Urie

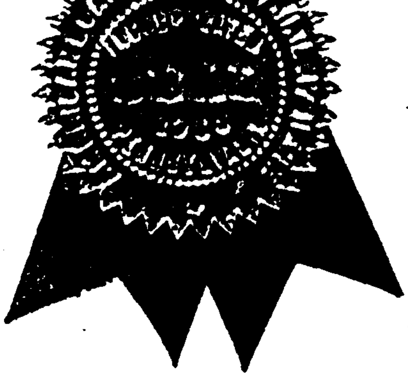
having met all requirements through
education, experience, and examination,
is hereby certified in the

COMPREHENSIVE PRACTICE
of
INDUSTRIAL HYGIENE

and has the right to use the title and designations

CERTIFIED INDUSTRIAL HYGIENIST

CIH



July 20, 1987
date

Charles E. Adkins
Chairman ABIH
Charles E. Adkins, CIH

3681
certificate number

Loren A. Anderson, Jr.
Secretary ABIH
Loren A. Anderson, Jr., CIH

The

American Board of Industrial Hygiene

ABIH®

AMERICAN BOARD OF INDUSTRIAL HYGIENE®

organized to improve the practice of Industrial Hygiene proclaims that

Bernhard Alexy

having met all requirements through education, experience, and examination, is hereby certified in the

COMPREHENSIVE PRACTICE
of
INDUSTRIAL HYGIENE

and has the right to use the title and designations

CERTIFIED INDUSTRIAL HYGIENIST

CIH

June 30, 1988
date

Chairman ABIH
Charles E. Adkins, CIH

3851
certificate number

Secretary ABIH
Loren A. Anderson, Jr., CIH

MAJOR SAFETY
INSTRUCTIONAL SERVICES

Red Rocks
Community College

Environmental Technologies, Campus Box 22
13300 West 6th Avenue ■ Lakewood, CO 80401-5398

E.P.A. ACCREDITATION NO.
MP-MSIS-001291-CO

CERTIFIES THAT

BERNIE ALEXY

Has completed the special course in:

AHERA MANAGEMENT PLANNER TRAINING

APRIL 4-5, 1991

expires APRIL 5, 1992

Carrie Jo Bosworth

TRAINING COORDINATOR

Invalid without raised seal

SEAL

HAGER
LABORATORIES, INC.

This is to certify that

DIANE D. ROBINSON

has successfully completed the EPA-Approved AHERA

ASBESTOS CONTRACTOR/SUPERVISOR INITIAL TRAINING COURSE AND EXAMINATION

For purposes of accreditation required under
Section 206 of the Toxic Substances Control Act (TSCA)

Conducted by

ENVIRONMENTAL SERVICES INSTITUTE

P.O. BOX 4012, GOLDEN, CO 80401-4012

This course has been
granted approval by:

EPA Region: VIII
the State of: Colorado
the City of: Denver

CS-275
Certificate Number

March 12, 1991
Expires on above date

Industrial Hygienist/Instructor

HAGER
LABORATORIES, INC.

This is to certify that

DIANE D. ROBINSON

has successfully completed the EPA-Approved AHERA

ASBESTOS ABATEMENT WORKER
INITIAL TRAINING COURSE AND EXAMINATION

For purposes of accreditation required under
Section 206 of the Toxic Substances Control Act (TSCA)

Conducted by

ENVIRONMENTAL SERVICES INSTITUTE

P.O. BOX 4012, GOLDEN, CO 80401-4012

This course has been
granted approval by:

EPA Region: VIII
the State of: Colorado
the City of: Denver

W-408
Certificate Number

March 11, 1991
Expires on above date

Industrial Hygienist/Instructor

024

Certificate of Course Completion

in

AHERA-APPROVED BUILDING
INSPECTOR COURSE & EXAMINATION

Given by

Colorado State University

For purposes of accreditation required under Section 206 of the Toxic Substance Control Act (TSCA).

Be It Known That:

Brian Miller

is hereby awarded this certificate which attests to this achievement.

SPONSORED BY:

R.L. Stollar & Associates, Inc.
Denver, Colorado

March 13, 1991

Earlie Thomas
Lead Asbestos Instructor
Department of Industrial Sciences

CERTIFICATE NUMBER: 476-88-8122
ACCREDITATION EXPIRES: 03/13/92

Certificate of Course Completion

in

AHERA-APPROVED BUILDING
INSPECTOR COURSE & EXAMINATION

Given by

Colorado State University

For purposes of accreditation required under Section 206 of the Toxic Substance Control Act (TSCA).

Be It Known That:

Linda A. Burdzinski

is hereby awarded this certificate which attests to this achievement.

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Denver, Colorado

March 13, 1991

COLORADO STATE UNIVERSITY
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Earle Thomas

Earlie Thomas
Lead Asbestos Instructor
Department of Industrial Sciences

CERTIFICATE NUMBER: 523-17-4187
ACCREDITATION EXPIRES: 03/13/92

Certificate of Course Completion

in

AHERA-APPROVED BUILDING
INSPECTOR COURSE & EXAMINATION

Given by
Colorado State University

For purposes of accreditation required under Section 206 of the Toxic Substance Control Act (TSCA).

Be It Known That:

Diane D. Robinson

is hereby awarded this certificate which attests to this achievement.

SPONSORED BY:

R.L. Stollar & Associates, Inc.
Denver, Colorado

March 13, 1991

Earlie Thomas

Earlie Thomas
Lead Asbestos Instructor
Department of Industrial Sciences

CERTIFICATE NUMBER: 557-96-4176
ACCREDITATION EXPIRES: 03/13/92

THE

ENVIRONMENTAL Training Center

CERTIFIES THAT

Joan Henehan

has successfully completed

The **EPA-APPROVED AHERA ANNUAL REFRESHER COURSE** for Inspector
and has passed the required examination in that discipline

This course is EPA-approved under Section 206 of the Toxic Substances Control Act (TSCA)

Course date 1/15/91
No. of hours 4
Exam date N/A
Certificate No. DR011591-14
Expires 1/14/92

Lester K Ablin
Authorized Signature

Invalid without raised seal

THE

ENVIRONMENTAL Training Center

CERTIFIES THAT

Bernie Alexy

has successfully completed

The **EPA-APPROVED AHERA ANNUAL REFRESHER COURSE** for Inspector

and has passed the required examination in that discipline

This course is EPA-approved under Section 206 of the Toxic Substances Control Act (TSCA)

Course date 1/15/91

No. of hours 4

Exam date N/A

Certificate No. DR011591-13

Expires 1/14/92

Lester K Ablin

Authorized Signature

SEAL

Invalid without raised seal

THE

ENVIRONMENTAL Training Center

CERTIFIES THAT

Larry Thomas Hudnall

has successfully completed

The **EPA-APPROVED AHERA ANNUAL REFRESHER COURSE** for Inspector/Management Planner
and has passed the required examination in that discipline

This course is EPA-approved under Section 206 of the Toxic Substances Control Act (TSCA)

Course date 1/15/91
No. of hours 8
Exam date N/A
Certificate No. DR011591-08
Expires 1/14/92

Lester K Ablin
Authorized Signature

Invalid without raised seal

001

Certificate of Course Completion

in

AHERA-APPROVED BUILDING
INSPECTOR COURSE & EXAMINATION

Given by

Colorado State University

For purposes of accreditation required under Section 206 of the Toxic Substance Control Act (TSCA).

Be It Known That:

Trent Watne

is hereby awarded this certificate which attests to this achievement.

SPONSORED BY:

R.L. Stollar & Associates, Inc.
Denver, Colorado

March 13, 1991

Earlie Thomas
Lead Asbestos Instructor
Department of Industrial Sciences

CERTIFICATE NUMBER: 522-51-1485
ACCREDITATION EXPIRES: 03/13/92

Certificate of Completion

Recognizing the completion of all requirements in

AHERA-APPROVED BUILDING INSPECTOR AND MANAGEMENT
PLANNER COURSE AND EXAMINATION

Be it known that:

Earlie Thomas

is hereby awarded this certificate which attests to this achievement.

FORT COLLINS, COLORADO
November 7-11, 1988

COLORADO STATE UNIVERSITY · EDUCATION · SERVICE · RESEARCH · EXTENSION · 1870

For purposes of accreditation
required under Section 206 of the
Toxic Substance Control Act (TSCA)

CERTIFICATE NUMBER: 522-88-0762
ACCREDITATION EXPIRES: November 11, 1989

APPENDIX B

GUIDE FOR ASBESTOS HAZARD ASSESSMENT IN U.S. ARMY FACILITIES

DRAFT
28 Nov 1988

GUIDE FOR
ASBESTOS HAZARD ASSESSMENT
IN U. S. ARMY FACILITIES

Prepared by

CERL-Environmental Engineering Team

Bernie Donahue

I. Introduction

The potential for fiber release and subsequent area contamination from asbestos-containing building material (ACBM) or other ACM can be assessed by evaluating several factors. These include the physical condition and characteristics of the material and its location and use. Information collected by inspecting of a facility or part thereof can be used to assess the occupants' potential exposure to ACM fibers. The asbestos management team can use this measure of exposure potential to compare different facilities in order to determine their relative asbestos health hazards. The assessment scheme can also be used as a basis for prioritizing corrective actions.

A survey is defined in this guide as the inspection of facilities to locate, confirm the identity of, and measure the amount of ACBM or other ACM present. An assessment further evaluates the ACBM or other ACM in terms of (1) its potential to be airborne, or the actual extent to which it is a source of airborne fibers [damage], and (2) to what extent humans in the area containing asbestos are exposed to airborne fibers. Army asbestos management programs will include an assessment as an integral part of a survey.

II. Background

One of the first assessment techniques to be evaluated by the US Environmental Protection Agency (USEPA) was air monitoring. The idea was simple: air samples in the area around ACM would be collected to determine the concentration of asbestos fibers in fibers per cubic centimeter (f/cc). These concentrations could be compared with the Occupational Safety and Health Administration (OSHA) workplace standards to obtain a relative measure of the health hazard. Because air monitoring reflects conditions only at the time of sampling, it cannot serve as a measure of longterm fiber release potential. Air monitoring alone is not recommended by the USEPA for asbestos exposure assessment, nor is it used as part of any of the several commonly employed assessment schemes.

In the preparing of this document, six assessment methods were evaluated:

(1) EPA "Purple Book" - Chapter 4;

(2) EPA Region VII - 1982;

(3) EPA Draft 7 initial regulation - 1986;

(4) US Navy TR883 - Chapter 5;

(5) US Air Force "GRADE" system (based upon the Versar, Inc. method); and

(6) Hall-Kimbrell modified Sawyer algorithm.

Method (1) uses an empirical approach and method (3) is based upon a "decision tree." Methods (2), (4), (5), and (6) are numerical rating schemes. Each of the methods has merit, is self-contained, and is designed to provide a relatively easy asbestos hazard assessment protocol.

In the 30 April 1987 issue of the Federal Register (52FR15820), the USEPA published a proposed rule under section 203 of Title II of the Toxic Substances Control Act concerning ACM in public and private schools. The background discussion states, "The negotiating committee generally agreed that assessment, as provided in the proposed regulation, should be flexible enough to accommodate a wide variety of acceptable and available methods and schemes. . . Assessment was perceived as the means of collecting and considering whatever data was necessary for the management planner to make an informed, responsible recommendation . . . consistent with response action requirements." The decision tree (method 3) in the USEPA initial regulation - Draft 7 (1986) was dropped due to committee sentiment that it was inappropriate for the USEPA to require a single assessment method.

In accordance with the current USEPA regulation governing asbestos abatement activities in schools, assessments of ACM hazards in schools must be performed by an accredited inspector, regardless of the assessment methodology used. The inspector is to gain his or her accreditation through attendance at an USEPA-approved 3 day training course and passing of an attendant examination. USEPA also suggests that states issuing the accreditation require the inspectors to have at least a high school diploma and perhaps an associate degree in particular fields (e.g., environmental or physical sciences).

In light of this regulation, it seems obvious that USEPA considers all assessment methods as merely tools to be used by or under the supervision of trained personnel.

II. Discussion

It was determined that an asbestos hazards assessment scheme for the Army has to meet the following criteria:

(1) Be easy to understand and to use,

(2) Be quantitative enough to provide a measure of hazard severity (Assessment Index) that will allow the Installation Commander to prioritize facilities in terms of the need for corrective action.

(3) Provide a list of factors that cannot be easily quantified or included in an algorithm, but which the asbestos management team should consider in their decisions on corrective actions.

None of the six methods reviewed met all three criteria. The three USEPA methods were judged too empirical, providing an insufficient numerical basis for meaningful prioritizing. The modified Sawyer algorithm offered by Hall-Kimbrell and the Navy TR-833-Chapter 5 schemes failed to meet the third criterion. Although logical, the Air Force GRADE system with the multiple regression model also failed to meet the third criterion. However, the assessment checklist in the GRADE system, which includes the factors concerning the ACM physical

characteristics and condition, location and use is the most comprehensive of the six methodologies.

The assessment scheme discussed in this document is a modified US Air Force "GRADE" system. The checklist, Figure 1a or 1b, is identical to that of the Air Force, but the multiple regression equation has been replaced with an assessment index matrix, Table 1. To use this scheme, a trained inspector works through the checklist making value judgments for each of the Damage/Risk and Exposure factors. A total numerical value for Damage/Risk and Exposure are derived which are then used in Table 1 to determine a letter assessment index. For each letter index, a recommended corrective management action is listed in Table 2.

The assessment scheme is intended for a trained inspector to use; that is, someone who is familiar with common ACBM and miscellaneous ACM and knows of the layout and activities of the facilities. The scheme applies only to friable asbestos, to include either sprayed- or trowelled-on surfacing materials or pipe, boiler, and tank thermal insulation. Other nonfriable forms of ACM shall be managed satisfactorily by an O&M program with abatement necessary only as part of facility alteration/repair, maintenance, or demolition.

An ACM Survey, locating, sampling, and measuring homogeneous areas of ACM should be conducted concurrently with the assessment, when possible. The term "homogeneous area" here refers to an area of surfacing material, thermal system insulation material, or miscellaneous material that is uniform in color and texture.

IV. The Friable ACM Assessment Checklist

A Friable ACM Assessment Checklist is provided in a five-page annotated format, Figure 1a and as a compact one-page format, Figure 1b. Both formats are reproduced directly from method 5, with only superficial changes. The five-page format is intended primarily as a training aid. As an inspector becomes familiar with the assessment factors and what each of the weighted conditions means, he or she will be able to use the compact format.

The checklist is divided into two parts. Part I addresses the extent of existing damage and the potential for a risk of damage to friable ACBM. Part II addresses exposure and contains factors that contribute to health hazards in the occupied facility being inspected.

The assessment factors, e.g., Physical Damage, Water Damage, Asbestos Content, and the annotated, value-weighted conditions in a Figure 1a or 1b are self-explanatory. Some of the other assessment factors, however, have additional considerations that could influence the inspector's choice of a value-weighted condition. The remainder of this section deals with these additional considerations.

The assessment factors listed in Part I, are concerned with damage. Measuring the extent of damage to the ACM or the potential for damage is an important part of the assessment. This is because, in most cases, damaged ACM will, under identical conditions, release more

airborne asbestos fibers than undamaged ACM. Also, the more extensive the damage, the greater the potential for fiber release.

The first assessment factor listed, Physical Damage to the sprayed- .or trowelled-on surface ACM, has the five value-weighted condition of high, moderate, low, minimal, and none. An additional consideration for the inspector should be the age of the ACM. If the age is greater than 30 years, the normal deterioration of the binding agents may have produced a surface material that has a potential for fiber release per unit of surface area damaged much greater than for newer and similar surface ACM. An inspector who would normally rate a certain extent of damage as "Low" for 15-year-old sprayed-on ACM might want to rate the same extent of damage as "Moderate" for a 35-year-old material. The age of the ACM should also be considered when assessing the potential for damage from water and routine maintenance. In some assessment algorithms, the design of a roof above the ACM is considered. There is a greater potential for rainwater damage to ACM under a flat roof than under a sloped or hipped roof.

In considering the Asbestos Content factor, the assumption is that as the percentage of asbestos in the ACM increases so does the potential for airborne fiber release. This would undoubtedly be true if the same binding agent were used in all ACM. However, not all ACM are created equal. It is quite possible that an ACM with an easily degraded starch binder (water soluble) and an asbestos content of 15 percent would have a greater fiber release potential than an ACM with 50 percent asbestos and a water insoluble binder. The choice of a weighted-value condition by an inspector should reflect this consideration only if very specific and relevant information is available.

V. Management Considerations

Even though an assessment index may accurately reflect the existing asbestos health hazard within a facility, it most likely will not be an accurate measure of the asbestos management problem. No economic or social factors enter into the assessment index. These factors often represent the greatest obstacles in the management or control of asbestos hazards. A set of appropriate considerations is listed below.

A. Cost Considerations (Estimating Cost Effectiveness)

1. Cost of the abatement (Contractor's estimate + In-house personnel dedication)
2. Cost of temporarily relocating personnel and equipment for the abatement.
3. Cost of nonproductivity resulting from relocation of personnel and equipment.
4. Cost savings in preplanned remodeling, renovation and/or repair projects resulting from abatement activities.
5. Cost savings associated with enhanced use of rooms, areas, or buildings which have been purged of ACM hazards.

B. Morale Considerations

1. Effect of abatement-related personnel relocation of on morale (see A-3).
2. Effect of the notification of the need for abatement action on the morale of those individuals who occupy the space. Any abatement action will alert them to the fact that they had been working in a space judged to be a high risk environment.

C. Miscellaneous Considerations

1. Effects of flooding, wind, and fire damage on ACM integrity.
2. Climatological restrictions on abatements. (Amended water can freeze thus making spraying impossible!)
3. Geographical restrictions on abatements--OCONUS installations may have special problems.
4. High security areas, problems with unauthorized access or potential compromise.
5. Special facility use (child care centers and hospitals).

Fig. 1a
ARMY FRIABLE ACM ASSESSMENT CHECKLIST

Installation: Bldg/Rm Nos.:

Facility/Office: Inspector (date):

Sample Numbers (Air and Bulk):

PART I: DAMAGE or RISK

-Physical. Assess damage based on visible evidence of work surface accumulation or the condition of the sprayed-on or trowelled-on surface materials.

_____(5) High - Dislodged pieces are evident on work surfaces.
_____(4) Moderate - There is evidence of visible material fallout.
_____(2) Low - There some evidence of material fallout.
_____(1) Minimal - There are isolated and very small areas of material damage or fallout.
_____(0) None - No damage or evidence of any material fallout.

-Water.

_____(3) Yes - Visible water damage.
_____(0) No - No water damage.

-Proximity to items for repair. If both A and B apply, score the one with the highest rating. (Check all that apply. Maximum of 3 points.) How far is the material from routine maintenance areas?

A. Sprayed-on or Trowelled-on: Could the material be damaged by routine maintenance?

_____(3) < 1 ft or a ceiling panel contaminated with ACM must be removed.
_____(2) $1 \leq ? < 5$ ft
_____(1) ≥ 5 ft
_____(0) ≥ 5 ft and no routine maintenance.

B. Pipe, Boiler, or Duct Insulation: Could damage occur as a result of routine maintenance.

_____(3) A ceiling panel contaminated with ACM must be removed.
_____(1) Yes
_____(0) No

-Type of Material. If area or room contains numerous categories of material, score the friable material with the largest area. Check all other categories that are found.

_____(0 - 4) Other material, i.e., wallboard, ceiling tile, or floor tile with exposed friable ends, abrasions, etc.
_____ (1) Boiler and/or pipe
_____ (3) HVAC - Suspected ACM on exterior or ducts
_____ (4) Cellings or Walls

-<u>Potential for Contact by Occupants.</u> How far is the friable sprayed-on, trowelled-on, or damaged material from the heads of the room or area occupants, regardless of whether there is a barrier? (High, medium, and low refer to the chance of the room or area personnel actually disturbing the ACM.)

<10 ft		≥10 ft	
____(8)	High	______(5)	High
____(5)	Medium	______(3)	Medium
____(2)	Low	______(0)	Low

-<u>Asbestos Content.</u> Use the percentage for the material that has the highest probability of becoming airborne.

____(1) $1 < \% \leq 30$
____(3) $30 < \% \leq 50$
____(5) $> 50\ \%$
____ All bulk samples from the friable surface or damaged material(s) indicate asbestos. If so, NO HAZARD.

Bulk sample results

Sample No.	Type Asbestos	%	Source

DAMAGED (D) TOTAL______(Max 28, Min 1) Evaluator (date)__________

ARMY FRIABLE ACM ASSESSMENT CHECKLIST
Part II: EXPOSURE

-Friable. Defined by USEPA: "hand pressure can crumble, pulverize, or reduce to powder when dry." Score the friability of the surface or damaged material.

_____(6) High - Material is fluffy and/or the slightest hand pressure can dislodge it. A slight breeze may disperse the material.
_____(3) Moderate - Material can be dislodged or scraped or crumbled by hand.
_____(1) Low - Material is firmly bound, difficult to scrape off by hand.

-Area of visible surface or damaged friable material.

_____(0) < 10 ft^2 These small areas should be repaired ASAP.
_____(1) $10 \leq$ ft$^2 < 100$
_____(2) $100 \leq$ ft$^2 < 1000$
_____(3) ≥ 1000 ft^2

-Surface material. Refers to the ability of the surface material to hold fibers for reentrainment. If more than one type, score the roughest. If the material is exposed friable asbestos, score as rough.

_____(4) Rough. Difficult to clean with a HEPA vacuum.
_____(3) Pitted. Difficult to clean with a damp cloth but cleanable with a HEPA vacuum.
_____(2) Moderate. Can be cleaned with a damp cloth.
_____(1) Smooth. Easily cleaned with a damp cloth.

-Ventilation. Check all categories that apply. (Maximum 7 points)

_____(5) The interior of the supply duct or plenum is coated or littered with friable material or is within 5 feet of a supply diffuser or fan and the condition of the material may result in fibers being entrained into the airflow.
_____(2) The interior of the return air duct or plenum is coated or littered with friable material and is part of a recirculating system.
_____(1) Air being supplied to the room or area is: (1) drawn from an area where the potential for asbestos fiber release is possible, or (2) part of a recirculating system where fibers may be drawn into the system.
_____(0) None of the above applies.

-Air Movement. This refers to the general air movement in the room or area that may affect the friable surface or damaged material.

_____(5) Material is subjected to routine turbulent or abrupt air movement.
_____(2) Material is exposed to perceptible or occasional air streams.
_____(0) No perceptible air flow in the room or area.

-Activity. Refers to forces acting on the surface covered, i.e., vibrational, water or steam, etc.

_____(5) High - Friable surface or damaged material is subject to constant vibration (mechanical room).
_____(2) Medium - Occasional vibration. (a warehouse where forklifts are used, next to an active runway, kitchen)
_____(0) Low - Administrative office, library, classroom, storage room, stairway or corridor, waiting room, etc.

-Floor.

_______(4) Carpet or an extremely rough surface difficult to clean by HEPA vacuum or by a damp cloth.
_______(2) Seamed or rough surface (e.g., uncoated concrete)
_______(1) Smooth continuous surface (e.g., finished or coated concrete, smoothly joined tile, etc.).
_____(0 - 4) Unique situations (wood or dirt floors with varying degrees of smoothness).

-Barriers. If both A and B apply, score the one with the highest rating. Check all that apply. (Maximum of 4 points)

A. Refers to sprayed-on or trowelled-on material on ceiling or walls.

_____(1) Suspended ceiling or accessible secondary wall.
_____(2) Encapsulation or covered with nonasbestos material.
_____(3) Railing or chicken wire.
_____(4) None.

B. Pipe, boiler, duct, or other surface or damaged materials. Percent of total exposed and visible to the occupants.

_____(1) $\leq$ 25%
_____(2) 25 < % $\leq$ 50
_____(3) 50 < % $\leq$ 75
_____(4) 75 < % $\leq$ 100

-<u>Population.</u> This involves defining the average occupancy and outside visitor traffic (do not count visitors from within the building) of a room or area based on an 8 hour per day exposure. For example, a reception area in a DEH shop normally has 15 individuals assigned to the office. They see approximately 240 customers from outside the building over an 8 hour day. Each customer is serviced and gone within 30 minutes.

([240 persons X 0.5 hours] / 8 hours) + 15 occupants = 30

.... Score as 2

_____(1) $\leq$ 9 or for corridors
_____(2) 10 $\leq$ Pop $\leq$ 200
_____(3) 201 $\leq$ Pop $\leq$ 500
_____(4) 501 $\leq$ Pop $\leq$ 1000
_____(5) $\geq$ 1001 for medical facilities, youth centers, child care facilities or residential buildings, regardless of the population.

EXPOSURE (E) TOTAL_____________(Max 43, Min 5) Evaluator (date)__________

Fig. 1b

ARMY FRIABLE ASBESTOS ASSESSMENT CHECKLIST

Form # __

BASE:__________ BLDG/RM NOS.__________ FACILITY/OFFICE:__________ INSPECTOR (DATE)___

******** Part I: DAMAGE/RISK ********

- Physical Damage, Visible evidence:_____(5) High;____(4) Moderate;_____(2) Low;____(1) Minimal;_____(0)None
- Water Damage: ____(3) Yes; _____(0) No
- Proximity to Items for Repair. If both a. and b. apply score the one with the highest rating. (Max 3 pts). How far? :

"a". Sprayed or Trowelled-on:_____(3) <1 ft or ceiling panel contam.; ____(2) 1≤?<5 ft;___(1) ≥5 ft; ____(0) ≥5 ft No rout. maint.

"b". Pipe, Boiler, or Duct Insulation, Damage by routine maint. ? : ____(3) ceiling panel contam.; ____(1) Yes; ____(0) No

- Type of Mat'l:____(0-4) Other Friable mat'l;____(1) Boiler and/or pipes;____(3) HVAC;____(4) Ceilings or walls
- Potential for Contact: "<10 ft" ____(8) High;____(5) Medium;____(2) Low; "≥10 ft" ____(5) High; ____(3) Medium;____(0) Low
- Asbestos Content, % with highest prob: ____(1) 1<%≤30;____(3) 30<%≤50;_____(5) >50%; <u>NO HAZARD all samples no asbestos</u>

Damage (D) Total__________

******** Part II: EXPOSURE ********

- Friable: ____(6) High;____(3) Moderate;____(1) Low
- Area of Visible Mat'l: ____(0) <10 ft^2;____(1) 10≤ ft^2<100;____(2) 100≤ ft^2<1000;____(3) ≥1000 ft^2
- Walls: ____(4) Rough; ____(3) Pitted;____(2) Moderate;____(1) Smooth
- Ventilation (max 7 pts): _____(5) Interior supply;____(2) Interior return;____(1) Air supply-Fiber potential;____(0) None
- Air Movement Affecting Mat'l: ___(5) Routine turbulent or abrupt air mvmt;___(2) Exposed to percept air;___(0) No percept air
- Activity: ___(5) High-constant vibes;___(2) Medium-occasional vibes;____(0) Low-admin office, classroom, waiting room, etc.
- Floor: ____(4) Carpet;____(2) Seamed or rough surface;____(1) Smooth continuous surface;____(0-4) Unique situations
- Barriers. If both a. and b. apply, score theone withthe highest rating. check all that apply (Max of 4 pts):

"a". Sprayed or trowelled-on on ceiling or walls: ___(1) Suspend ceiling;___(2) Encapsulation;___(3) Railing or wire;___(4) None

"b". Pipe, Boiler, Duct, or Other Mat'l: ____(1) ≤25%;____(2) 25<%≤50;____(3) 50<%≤75;____(4) 75<%≤100

- Population: ____(1)≤9 or for corridors;___(2)10≤Pop≤200;____(3)201≤Pop≤500;____(4)501≤Pop≤1000;___(5)≥1001 or med or youth

Exposure (E) Total__________

Sample Numbers (Air & Bulk):__________

Table 1

Determination of an Assessment Index

Using the Damage/Risk and Exposure values derived from the checklist (Figure 1a or 1b), enter the matrix below and find the corresponding assessment index.

		Exposure (4 < E < 43)			
		43-26	25-17	16-8	7-4
Damage/Risk (1 < D < 28)	28-17	A	A	A	B
	16-11	A	B	C	D
	10-5	A	B	C	E
	4-1	A	C	D	F

Table 2

Assessment Index	Recommended Management Corrective Actions
A	Immediate Action - Requires assessment by accredited personnel* (in-house or contractor) who are experienced in and qualified to conduct asbestos assessments. Possible follow-up actions may include isolation of the area and the restriction of access and/or immediate removal of the ACM. If removal is indicated, action planning should include a detailed survey. This condition will likely involve a near term expenditure of funds. Managers must know exactly what needs to be done to eliminate the asbestos hazard and how to use available funds most effectively.
B	Action as Soon as Possible - Requires assessment by accredited personnel* (in-house or contractor) who are experienced in and qualified to conduct asbestos assessments. Initiate a Special O & M** program immediately. *Possible follow-up actions may* include the limiting of access to the area and the scheduling of removal during periods of low activity in the facility, not waiting for the normal repair and maintenance cycle.
C	Planned Action - Requires assessment by accredited personnel* (in-house or contractor) who is experienced in and qualified to conduct asbestos assessments. Initiate a Special O & M** program. Removal should be scheduled as part of the normal repair and maintenance cycle of a facility, minimizing cost and disturbance.
D	Repair - Initiate Special O & M** using accredited personnel*. Damaged areas should be repaired, where "repair" means returning damaged ACBM to an undamaged condition or to an intact state so as to contain fiber release. Schedule removal when practical and cost effective. Take preventative measures to reduce further damage.
E	Monitoring - Continue Special O & M** using accredited personnel*. Take steps to prevent damage to the ACBM or other ACM. Monitor frequently the condition of all ACM.
F	No Immediate Action - Continue Special O & M** using accredited personnel* until major renovation or demolition requires removal or until assessment factors change.

* Accredited personnel are industrial hygienists (American Board of Industrial Hygiene (ABIH) certified or who meet the Office of Personnel Management's 0690 classification standard) and other trained persons with a minimum of 1 year experience in asbestos assessment activities and who are accredited in the specific area they will be responsible for (inspector management planner, abatement designer, contractor, supervisor, and abatement worker) as specified in Section 206 of Title II of TSCA.

** An O & M program may include enclosure and encapsulation, where appropriate, to increase effectiveness.